Project Report: Interplanetary Pioneers

Project Investigators:	***Rocco Mancinelli , Lynn Rothschild***

Project Progress

At Ames, Rothschild and co–workers have begun work on an extremely halophilic alga, *Dunaliella salina* , to test for radiation resistance. Kranner is investigating seeds for possible flight potential, with a current emphasis on orchids. Consolmagno is investigating meteorites with exceptionally large cracks as models for vehicles.

In conjunction with the German Space Agency (DLR) in Cologne, Germany we have conducted two ground–based studies for science and technology compatibility.

1. The DLR has designed and built a simulation chamber to mimic the conditions as close as possible as the samples will encounter during the mission.
2. The DLR has designed and built a sample holding rack that is a duplicate of flight rack.
3. Two studies have been completed using the system
    1. The first was to define sample compatibility with the rack materials as well as the potential for sample cross contamination. The results showed that the samples are not harmed by the rack materials and that samples will not cross contaminate.
    2. The second was a temperature test to define the maximum and minimum temperatures that samples could withstand during pre–launch, launch, flight, and return without being harmed. Results indicated that the upper temperature limit is 50°C. When samples were held at –25°C for 3 months no deleterious effects could be detected. If flight operations requirements require testing at lower temperatures we will do so.

Roadmap Objectives

- ***Objective No. 5.3:*** Biochemical adaptation to extreme environments
- ***Objective No. 6.2:*** Adaptation and evolution of live beyond Earth

Mission Involvement

*Mission Class**	*Mission Name (for class 1 or 2) OR Concept (for class 3)*	*Type of Involvement***
1	BioPan (ESA)	Co−Investigator
2	EXPOSE (ESA ISS mission)	Co−Investigator

* Mission Class: Select 1 of 3 Mission Class types below to classify your project:
1. Now flying OR Funded & in development (e.g., Mars Odyssey, MER 2003, Kepler)
2. Named mission under study / in development, but not yet funded (e.g., TPF, Mars Lander 2009)
3. Long−lead future mission / societal issues (e.g., far−future Mars or Europa, biomarkers, life definition)

** Type of Involvement = Role / Relationship with Mission
Specify one (or more) of the following: PI, Co−I, Science Team member, planning support, data analysis, background research, instrument/payload development, research or analysis techniques, other (specify).

The research outlined in the proposal has been selected by the European Space Agency (ESA) based on my proposal in response to the ESA Announcement of Opportunity for Externally Mounted Payloads during the Early Space Utilization Period. (SP−1201). The hypotheses will be tested using ESA s external platform space exposure facility (EXPOSE). The cost of all flight related activities, the design and fabrication of flight hardware, as well as equipment and supplies to conduct ground simulation studies conducted in Europe are paid by ESA, work conducted in the US, travel, and time (salary) spent on the project in the US and Europe are to be paid by NASA. That is the funds are for ground based research in support of the ESA funded flight experiments.

EXPOSE is a multi−user external facility for exobiological experiments in the environment of space. It has been selected by ESA for the Early Utilization Period of the ISS and will stay for 1.5 years in space.